

**REMARKS**

Claims 29-53 are pending in the application.

Claims 29-52 have been rejected.

Claims 29, 44, 46, 50 and 52 have been amended.

Claims 30-43, 45, 47, 48 and 51 are kept unchanged.

Claim 49 is canceled.

Claim 53 has been added.

**35 U.S.C. 112**

Claims 29-52 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 29 has been amended. The phrase “radical polymerization initiator” now refers to a “radical polymerization initiator compound”. Applicant submits that this language distinguishes the process according to the invention over a process using radiation.

In amended claim 29, m and n are greater than 1. Applicant submits that the compounds of formulae (IA) and (IB), with this definition, embrace polymeric sequences.

In amended claim 29, the term “such as” has been deleted. Groups that were recited after this term are now recited in new claim 53.

For the reasons discussed above, Applicant respectfully requests that the Examiner now reconsider and withdraw the rejection of claims 29-52 under 35 U.S.C. 112,

second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The instant invention

The instant invention relates to a process for making block polymers of formula (IA) or (IB), comprising a dithiocarbamate groups of formula  $-S-CS-Z$  or  $-S-CS-NR^2R^3$  at one end, and a group  $R^1$  at the other end. The process comprises reacting:

- an ethylenically unsaturated monomer of formula  $CYY' (=CW-CW')_a=CH_2$ ,
- a radical polymerization initiator compound, and
- a (polymeric) precursor compound of formula (IIA) or (IIB), comprising a dithiocarbamate at one end, and a group  $R^1$  at the other end.

According to claims 44 and 46, the precursor compound is obtained by reacting:

- an ethylenically unsaturated monomer of formula  $CXX' (=CV-CV')_b=CH_2$ ,
- a radical polymerization initiator compound, and
- a compound (transfer agent) of formula (IIIA), (IVA), (IIIB), (IVB), or (VB).

35 U.S.C. 102(b) - Himori et al.

Claims 29-52 are rejected under 102(b) as being anticipated by Himori et al. (EP 296850).

Himori et al. describe making AB type block copolymers by a process using UV-radiation.

Applicant submits the language “radical polymerization initiator compound” distinguishes the process according to the invention over process using radiation. Therefore, Applicant submits that process claims 29-48 are not anticipated by Himori et al.

Claim 49 has been canceled.

The process using UV radiation described by Himori et al., leads to block copolymers having a high polydispersity index  $I$  ( $I=M_w/M_n$ ). On page 22 lines 14-16, Himori et al. teach that when  $M_n$  is about 10000, then  $M_w$  is about 20000, and that when  $M_n$  is about 100000, then  $M_w$  is about 200000. Measured values are given in the Examples (preparation 1 to preparation 6. Applicant reports these values below:

Himori's Preparation	First step (first block)	Second Step (block copolymer obtained)
1	$I = 22000/9800 = 2.24$	$I = 45000/22000 = 2.045$
2	$I = 23000/9000 = 2.56$	$I = 48000/23000 = 2.09$
3		$I = 46000/22000 = 2.09$
4		$I = 46000/21000 = 2.19$
5	$I = 22000/9800 = 2.24$	$I = 49000/23000 = 2.13$

Thus, Himori et al. disclose block copolymers having a polydispersity index of more than 2.

The block polymers according to instant product claims 50-52, have a polydispersity index of not more than 2. Therefore, Applicant submits that claims 50-52 are not anticipated by Himori et al.

For the reasons discussed above, Applicant respectfully requests that the Examiner now reconsider and withdraw the rejection of claims 29-52 under 102(b) as being anticipated by Himori et al. (EP 296850).

35 U.S.C. 102(b) – Tatsuya et al.

Claims 29-52 are rejected under 35 U.S.C. 102(b) as being anticipated by Tatsuya et al. (JP 04198303).

Applicant provides the Examiner with a courtesy copy, attached, of a translation of the Japanese patent application.

The reference describes the following embodiments:

- [1] Simple (as opposed to macromolecular) polymerization initiators, and processes for making the same,
- [2] Using the simple polymerization initiators in polymerizing vinyl monomers,
- [3] Macromolecular polymerization initiators, and processes for making the same, and
- [4] Using the macromolecular polymerization initiators in polymerizing vinyl monomers, to obtain block polymers (or graft polymers).

The reference describes many polymerization initiators and groups comprised therein. Applicant submits that the only relevant groups are dithiocarbamate groups of formula (10), noticed by the Examiner in the Office Action. Applicant now details the teachings of the reference for each embodiment.

[1] Simple polymerization initiators (see end of page 4 to beginning of page 5). Simple polymerization initiators comprising dithiocarbamate groups of formula (10) are not described (they comprise groups of formula (1)-(4), see on page 5). Therefore, Applicant submits that the simple polymerization initiators described in the reference are not relevant. The reference describes processes for preparing the simple polymerization initiators (processes (a)-(g), end of page 10 to middle of page 12). Applicant submits that these teachings are not relevant either. Compounds described in Preparative Examples 1-24 are simple polymerization initiators.

[2] Using the simple polymerization initiators. The reference teaches polymerizing vinyl monomers in the presence of the simple polymerization initiators [1]. Practical Examples 1-24 describe making monoblock polystyrene or poly(methacrylic acid), with using the simple polymerization initiators [1]. The reference does not describe polymerizing monomers in the presence of a further initiator, distinct from the simple polymerization initiators. On page 19, lines 27-33, the reference describes preparing block polymers by polymerizing a vinyl monomer and then another vinyl monomer. There is no Example in the reference describing such a process. Anyway, Applicant submits that this process is not relevant since the polymers obtained do not comprise a dithiocarbamate group of formula (10).

[3] Macromolecular polymerization initiators. The reference describes macromolecular polymerization initiators deriving from a polymer chain and comprising, at the ends (and/or at side chains) of the chain, dithiocarbamate groups of formula (10) (or irrelevant groups of formula (7), (8) or (9)). The compound described in Preparative

Example 30 is the only compound of the Examples comprising a dithiocarbamate group. Processes [E], [F], and [G] are processes from preparing a macromolecular polymerization initiator comprising dithiocarbamate groups at "either ends and/or side chains" (see page 18, lines 3-4, processes [A], [B], [C], [D] are not relevant because they concern initiators comprising groups of formula (7), (8) or (9)). Process [E] (page 17) comprise the steps of providing a polymer comprising hydroxyl groups at the ends of the chain, converting said hydroxyl groups into a halogenated group, and then reacting said group with an organo-metallic compound of formula (23), comprising a dithiocarbamate group. This process is used in Preparative Example 30, wherein a macromolecular polymerization initiator deriving from poly(propylene glycol) is prepared. Process [F] comprises the step of reacting a compound with a polymer comprising double bonds, by thermal addition. Process [G] comprises the step of reacting a polymer with a compound in the presence of a peroxide catalyst. Applicant submits that the macromolecular polymerization initiator described by the reference comprise several dithiocarbamate groups: the reference refers to ends of polymeric chains, or sides, the preparation processes involve polymers comprising several reactive groups (hydroxyl chain ends, double bonds comprised in a polymer...). This is confirmed on page 28, paragraph before table 3, wherein it is mentioned that A-B-A block copolymers are obtained: this implies that a reactive group is comprised at both chain ends of the macromolecular polymerization initiator.

[4] Using the macromolecular polymerization initiators. The reference teaches polymerizing vinyl monomers in the presence of the macromolecular polymerization

initiators [3], to obtain block or graft copolymers, comprising a block deriving from the macromolecular chain of the initiator, and blocks or grafts deriving the vinyl monomers. Practical Examples 25-37 describe making block copolymers comprising polystyrene or poly(methacrylic acid) blocks, with using the macromolecular polymerization initiators [3]. Practical Example 30 describes the preparation of a A-B-A block copolymer wherein block A is a polystyrene block and block B is a poly(propylene glycol) block (see on page 28, paragraph before table 3), by polymerizing styrene monomers in the presence of a macromolecular initiator comprising dithiocarbamate groups at both chain ends. The reference does not describe polymerizing the vinyl monomers in the presence of a further initiator, distinct from the macromolecular polymerization initiators.

Applicant submits that the simple polymerization initiators [1] of the reference do not read on the compounds (transfer agent) of formula (IIIA), (IVA), (IIIB), (IVB), or (VB), or on the precursor compounds of formula (IIA) or (IIB), because they do not comprise a dithiocarbamate group.

Applicant submits that compounds obtained by polymerizing vinyl monomers with using the simple polymerization initiators [1] do not anticipate the precursor compounds of formula (IIA) or (IIB), because simple polymerization initiators [1] do not comprise dithiocarbamate groups.

Applicant submits that the macromolecular polymerization initiators [3] of the reference do not read on the precursor compounds of formula (IIA) or (IIB),

because they comprise groups such as dithiocarbamate groups at both ends of the polymeric chain. Moreover, Applicant submits that macromolecular compounds comprising a dithiocarbamate of formula  $-S-CS-Z$  or  $-S-CS-NR^2R^3$  at one end, and a group  $R^1$  at the other end, are not described in the reference. Moreover, Preparative Example 30 comprises a poly(propylene glycol) macromolecular chain, that does not read on the block formula  $-[CXX'-(CV=CV')_b-CH_2]-$  according to the invention.

Applicant submits that the invention is not anticipated by the processes [2] and [4] of the reference, because the reference does not describe using a further initiator, distinct from the polymerization initiators [1] or [3], for polymerizing vinyl monomers. Moreover, Applicant submits that the invention is not anticipated by the processes [2] and [4], because the polymerization initiators used therein do not anticipate the compounds (transfer agent) of formula (IIIA), (IVA), (IIIB), (IVB), or (VB), as submitted above.

For the reasons discussed above, Applicant respectfully requests that the Examiner now reconsider and withdraw the rejection of claims 29-52 under 35 U.S.C. 102(b) as being anticipated by Tatsuya et al. (JP 04198303).

Requested reference "D4"

As requested by the Examiner, Applicant encloses a copy of the reference "D4", Macromolecules, 1990, 23, 1856-1859, Photoinitiated Block Copolymer Formation



RN97162G1  
Serial number 09/582,390  
AMENDMENT

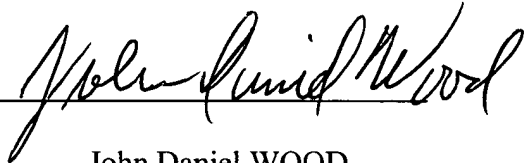
Using Dithiocarbamate Free Radical Chemistry, S. Richard Turner and Richard W. Blevins, discussed in the written opinion of the preliminary exam report.

In view of the preceding remarks, it is asserted that the patent application is in condition for allowance. Should the Examiner have any question concerning these remarks that would further advance prosecution of the claims to allowance, the examiner is cordially invited to telephone the undersigned attorney at (609) 860-4192. A notice of allowance is respectfully solicited.

Respectfully submitted,

July 29, 2002

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By 

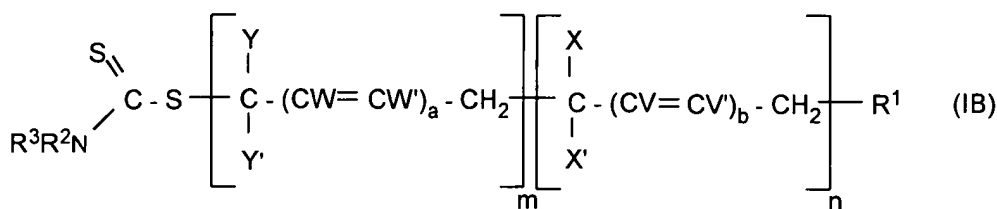
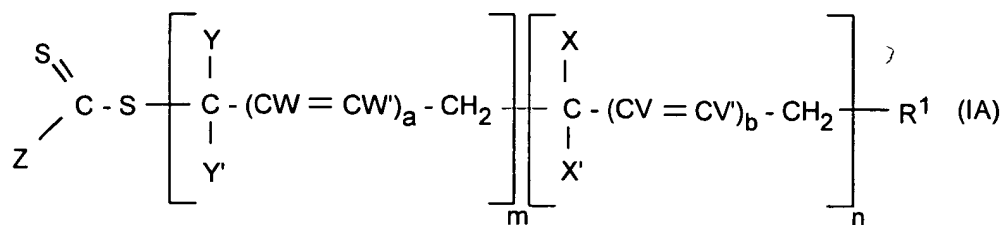
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RN97162G1 Amend.doc

Marked-up amended claims

Please amend claim 29 as follows:

29. (Amended) A process for preparing block polymers of general formula (IA) or (IB):



in which formulae:

-  $\text{R}^1$  represents:

- an optionally substituted alkyl, acyl, aryl, alkene or alkyne group (i),
  - an optionally substituted or aromatic, saturated or unsaturated, carbocycle (ii), or
  - an optionally substituted or aromatic, saturated or unsaturated, heterocycle (iii),
- optionally, these groups and rings (i), (ii) and (iii) are substituted with substituted phenyl groups, substituted aromatic groups, or groups: alkoxycarbonyl or aryloxycarbonyl (-COOR), carboxyl (-COOH), acyloxy (-O<sub>2</sub>CR), carbamoyl (-CONR<sub>2</sub>), cyano (-CN), alkylcarbonyl, alkylarylcarbonyl, arylcarbonyl, arylalkylcarbonyl, phthalimido, maleimido, succinimido, amidino, guanidimo, hydroxyl (-OH), amino (-NR<sub>2</sub>), halogen, allyl, epoxy, alkoxy (-OR), S-alkyl, S-aryl,

organosilyl, groups having a hydrophilic or ionic character, ~~such as the alkali metal salts of carboxylic acids, the alkali metal salts of sulphonic acid, polyalkylene oxide chains (PEO, PPO), cationic substituents (quaternary ammonium salts),~~

R representing an alkyl or aryl group,

- Z is an optionally substituted ring comprising a nitrogen atom via which Z is linked to the C(=S)-S- group of formula (IA), the other atoms of said ring inducing a delocalizing or electron-withdrawing effect with respect to the electron density of the nitrogen atom,

-  $R^2$  and  $R^3$ , which are identical or different, represent:

an optionally substituted alkyl, acyl, aryl, alkene or alkyne group (i),

an optionally substituted or aromatic, saturated or unsaturated, carbocycle (ii), or

an optionally substituted, saturated or unsaturated, heterocycle (iii),

optionally, these groups and rings (i), (ii) and (iii) are substituted with:

- substituted phenyl groups or substituted aromatic groups,

- groups: alkoxycarbonyl or aryloxycarbonyl (-COOR), carboxyl (-COOH),

acyloxy (-O<sub>2</sub>CR), carbamoyl (-CONR<sub>2</sub>), cyano (-CN), alkylcarbonyl,

alkylarylcarbonyl, arylcarbonyl, arylalkylcarbonyl, phthalimido, maleimido,

succinimido, amidino, guanidino, hydroxyl (-OH), amino (-NR<sub>2</sub>), halogen,

allyl, epoxy, alkoxy (-OR), S-alkyl, S-aryl,

- groups having a hydrophilic or ionic character, ~~such as the alkali metal salts of carboxylic acids, the alkali metal salts of sulphonic acid, polyalkylene oxide chains (PEO, PPO), cationic substituents (quaternary ammonium salts),~~

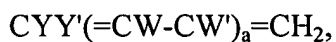
R representing an alkyl or aryl group,

and, for at least  $R^2$  or  $R^3$ , these groups and rings (i), (ii) and (iii) induce a delocalizing or electron-withdrawing effect with respect to the electron density of the nitrogen atom to which  $R^2$  and  $R^3$  are linked,

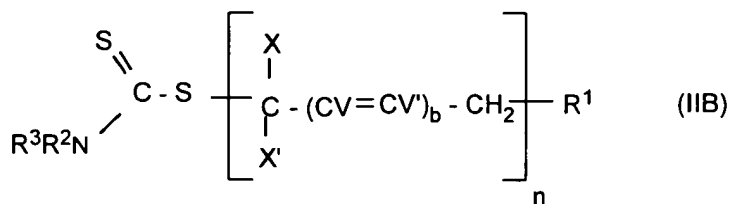
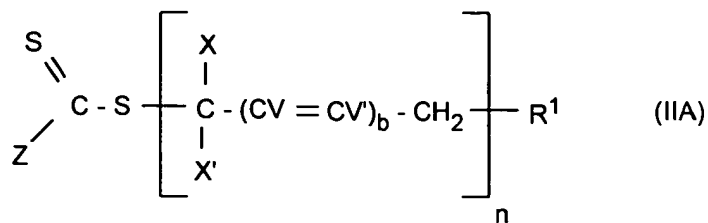
- V, V', W and W', which are identical or different, represent: H, an alkyl group or a halogen,
- X, X', Y and Y', which are identical or different, represent H, a halogen, a group  $R'$ ,  $OR'$ ,  $OCOR'$ ,  $NHCOH$ ,  $OH$ ,  $NH_2$ ,  $NHR'$ ,  $N(R')_2$ ,  $(R')_2N^+O^-$ ,  $NHCOR'$ ,  $CO_2H$ ,  $CO_2R'$ ,  $CN$ ,  $CONH_2$ ,  $CONHR'$  or  $CONR'_2$ , wherein  $R'$  is alkyl, aryl, aralkyl, alkaryl, alkene or organosilyl groups, optionally perfluorinated and optionally substituted with one or more carboxyl, epoxy, hydroxyl, alkoxy, amino, halogen or sulphonic groups,
- a and b, which are identical or different, are equal to 0 or 1,
- m and n, which are identical or different, are greater than or equal to 1 and, when one or other is greater than 1, the individual repeat units ~~are~~being identical or different,

said process comprising the step of bringing into contact with each other:

- an ethylenically unsaturated monomer of formula:



- a precursor compound of general formula (IIA) or (IIB):

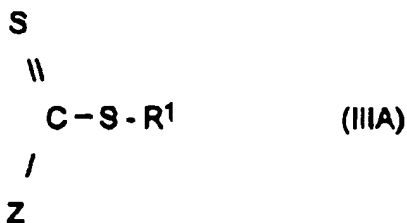


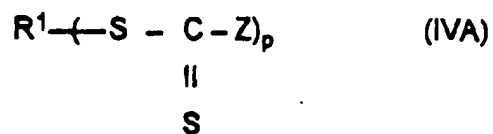
wherein Z, X, X', V, V', R<sup>1</sup>, R<sup>2</sup> and R<sup>3</sup> have the same meaning, and b and n the same value, as previously; and

- a radical polymerization initiator compound.

Please amend claim 44 as follows:

44. (Amended) A process according to claim 29, wherein the precursor compound of general formula (IIA) is a polymer coming from the radical polymerization of an ethylenically unsaturated monomer of formula: CXX' (=CV-CV')<sub>b</sub>=CH<sub>2</sub> during which said monomer is brought into contact with a radical polymerization initiator compound and a compound of general formula (IIIA) or (IVA):

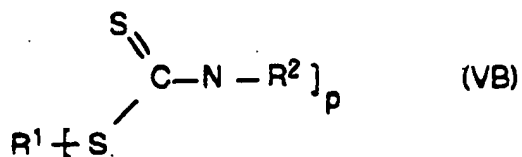
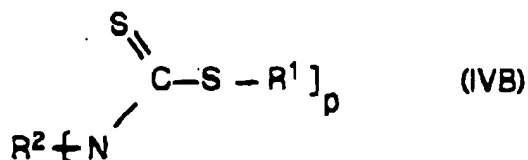
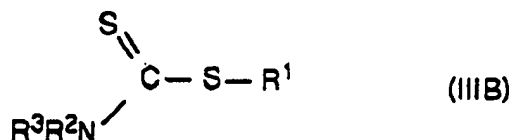




p being between 2 and 10.

Please amend claim 46 as follows:

46. (Amended) A process according to claim 29, wherein the precursor compound of general formula (IIB) is a polymer coming from the radical polymerization of an ethylenically unsaturated monomer of formula:  $\text{CXX}'(=\text{CV}-\text{CV}')_b=\text{CH}_2$  during which said monomer is brought into contact with a radical polymerization initiator compound and a compound of general formula (IIIB), (IVB) or (VB):



p being between 2 and 10.

Please cancel claim 49.

Please amend claim 50 as follows:

50. (Amended) Block polymer made by the process according to claim  
29 according to claim 49, having a polydispersity index of at most 2.

Please amend claim 52 as follows:

52. (Amended) Block polymer according to claim ~~49~~50, having at least two  
polymer blocks chosen from the following combinations:

- polystyrene/polymethyl acrylate,
- polystyrene/polyethyl acrylate,
- polystyrene/poly(*tert*-butyl acrylate),
- polyethyl acrylate/polyvinyl acetate,
- polybutyl acrylate/polyvinyl acetate, or
- poly(*tert*-butyl acrylate)/polyvinyl acetate.

Please add the new following claim 53:

53. (New) A process according to claim 29, wherein groups having a hydrophilic  
or ionic character are alkali metal salts of carboxylic acids alkali metal salts of  
sulphonic acid, polyalkylene oxide chains (PEO, PPO), or quaternary ammonium salts.